WATER SUPPLY OUTLOOK FOR WESTERN UNITED STATES

Including Columbia River Drainage in Canada

and

FEDERAL - STATE - PRIVATE COOPERATIVE SNOW SURVEYS

UNITED STATES DEPARTMENT of AGRICULTURE···SOIL CONSERVATION SERVICE
Collaborating with
CALIFORNIA DEPARTMENT of WATER RESOURCES
and
BRITISH COLUMBIA DEPARTMENT of
LANDS, FORESTS and WATER RESOURCES

AS OF
FEB. 1, 1968

TO RECIPIENTS OF WATER SUPPLY OUTLOOK REPORTS:

Most of the usable water in western states originates as mountain snowfall. This snowfall accumulates during the winter and spring, several months before the snow melts and appears as streamflow. Since the runoff from precipitation as snow is delayed, estimates of snowmelt runoff can be made well in advance of its occurrence. Streamflow forecasts published in this report are based principally on measurement of the water equivalent of the mountain snowpack.

Forecasts become more accurate as more of the data affecting runoff are measured. All forecasts assume that climatic factors during the remainder of the snow accumulation and melt season as they affect runoff will add to be an effective average. Early season forecasts are therefore subject to a greater change than those made on later dates.

The snow course measurement is obtained by sampling snow depth and water equivalent at surveyed and marked locations in mountain areas. A total of about ten samples are taken at each location. The average of these are reported as snow depth and water equivalent. These measurements are repeated in the same location near the same dates each year.

Snow surveys are made monthly or semi-monthly from January 1 through June 1 in most states. There are about 1400 snow courses in Western United States and in the Columbia Basin in British Columbia. In the near future, it is anticipated that automatic snow water equivalent sensing devices along with radio telemetry will provide a continuous record of snow water equivalent at key locations.

Detailed data on snow course and soil moisture measurements are presented in state and local reports. Other data or reservoir storage, summaries of precipitation, current streamflow, and soil moisture conditions at valley elevations are also included. The report for Western United States presents a broad picture of water supply outlook conditions, including selected streamflow forecasts, summary of snow accumulation to date, and storage in larger reservoirs.

Snow survey and soil moisture data for the period of record are published by the Soil Conservation Service by states about every five years. Data for the current year is summarized in a West-wide basic data summary and published about October 1 of each year.

PUBLISHED BY SOIL CONSERVATION SERVICE

D. A. WILLIAMS, Administrator

The Soil Conservation Service publishes reports following the principal snow survey dates from January 1 through June 1 in cooperation with state water administrators, agricultural experiment stations and others. Copies of the reports for Western United States and all state reports may be obtained from Soil Conservation Service, Western Regional Technical Service Center, Room 507, 701 N. W. Glisan, Portland, Oregon 97209.

Copies of state and local reports may also be obtained from state offices of the Soil Conservation Service in the following states:

STATE	ADDRESS
Alaska	P. O. Box "F", Palmer, Alaska 99645
Arizona	6029 Federal Building, Phoenix, Arizona 85205
Colorado (N. Mex.)	12417 Federal Building, Denver, Colorado 80202
Idaho	P. O. Box 38, Boise, Idaho 83707
Montana	P. O. Box 98, Bozeman, Montana 59715
Nevada	P. O. Box 4850, Reno Nevada 89505
Oregon	1218 S. W. Washington St., Portland, Oregon 97205
Utah	4012 Federal Building, Salt Lake City, Utah 84111
Washington	360 Federal Office Building, Spokane, Washington 99201
Wyoming	P. O. Box 340, Casper, Wyoming 82602

PUBLISHED BY OTHER AGENCIES

Water Supply Outlook reports prepared by other agencies include a report for California by the Water Supply Forecast and Snow Surveys Unit, California Department of Water Resources, P. O. Box 388, Sacramento, California 95802 --- and for British Columbia by the Department of Lands, Forests and Water Resources, Water Resources Service, Parliament Building, Victoria, British Columbia

USDA-SCS PORTLAND, OREG. 1966

WATER SUPPLY OUTLOOK FOR WESTERN UNITED STATES

Including Columbia River Drainage in Canada

ISSUED

FEBRUARY 1, 1968

The Soil Conservation Service coordinates snow surveys conducted by its staff and many cooperators, including the Bureau of Reclamation, Corps of Engineers, Forest Service, National Park Service, Weather Bureau, Geological Survey, and other Federal Agencies, Departments of State Government, Irrigation Districts, Power Companies, and others.

The Department of Water Resources coordinates snow surveys in California.

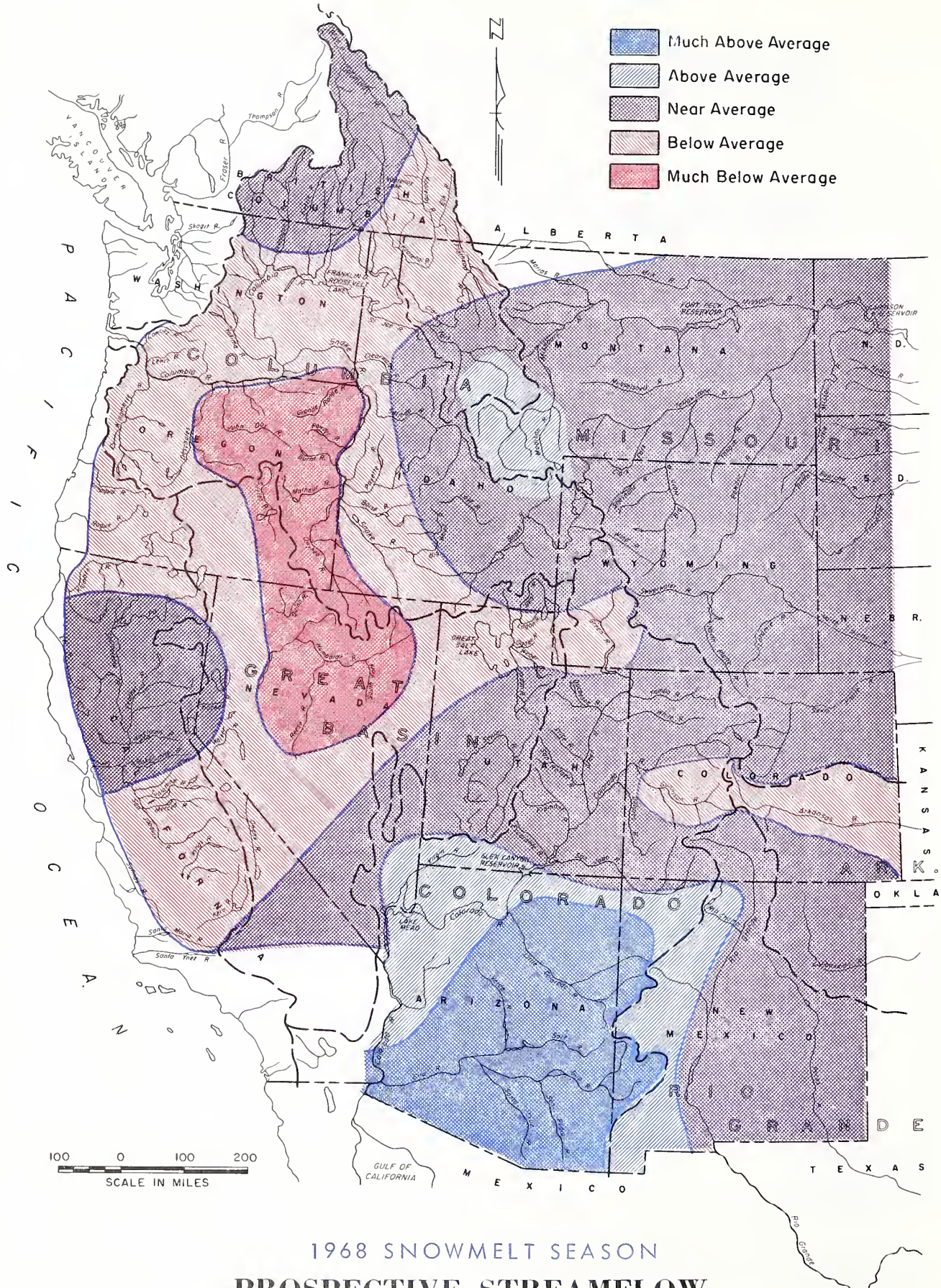
The Water Resources Service, Department of Lands, Forests, and Water Resources directs snow surveys in British Columbia.

This report was prepared by the Water Supply Forecasting Branch, Engineering Division, Soil Conservation Service, from data supplied by Snow Survey Supervisors of the Soil Conservation Service in the States of Alaska, Arizona, Colorado and New Mexico, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming.

Data from California was supplied by the Chief, Water Supply Forecast and Snow Survey Unit, Department of Water Resources.

Data from British Columbia was supplied by the Chief, Hydrology Division, Water Investigations Branch, Department of Lands, Forests and Water Resources.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
D. A. WILLIAMS, ADMINISTRATOR



1968 SNOWMELT SEASON

PROSPECTIVE STREAMFLOW

AS OF FEBRUARY 1, 1968

USDA-SCS-PORTLAND OREG 1965

WATER SUPPLY OUTLOOK

1968 SNOWMELT SEASON
AS OF FEBRUARY 1, 1968

EVEN WITH BELOW AVERAGE MOUNTAIN SNOWFALL FOR THE FIRST HALF OF THE SNOW ACCUMULATION SEASON, THE WATER SUPPLY OUTLOOK IS SATISFACTORY FOR MAJOR IRRIGATED AREAS. IF THE DEFICIENT SNOWFALL PATTERN PERSISTS, SHORTAGES COULD OCCUR ON THE ARKANSAS, RIO GRANDE AND SOME AREAS OF OREGON AND IDAHO. SNOWFALL IN ARIZONA HAS BEEN EXCESSIVE.

Streamflow prospects are highly varied for snowmelt streams in the western states for 1968. In general, early season snowfall has been slightly less than average. The greatest deficiencies were measured in the Great Basin areas of Nevada and Oregon and on adjacent areas of the Columbia Basin in Oregon and Idaho. On the other extreme a December storm brought excessive snowfall to Arizona mountains. A small area of the upper Missouri watersheds has also had above average snowfall.

The 1967 water year was one of generally excessive streamflow particularly in the Columbia Basin and from the Sierras in California. In these areas the excessive streamflow maintained or improved the favorable carryover storage picture that existed a year ago. To a lesser extent the above average streamflow and reduced demand for reservoir water extended east of the Continental Divide in to Montana and the Wasatch Range in Utah. In most of this area the water supply outlook will remain good even if the deficiency in snowfall continues for the remainder of the season. There are some local exceptions on streams with limited or no storage facilities.

A third year of extremely favorable surface water supplies is in prospect for Arizona. The heavy mountain snowfall in December caused high runoff and improved reservoir storage to a slightly better position than a year ago--near three times average. With the existing snowpack, two to three times the average runoff is anticipated for the spring months.

Another year of less than average flow is in prospect for the Colorado River and most of its tributaries above Lake Powell. Storage in the major reservoirs remains at about the same level as a year ago. The heavy snowfall in Arizona extended to some degree into southern Utah and southwestern Colorado.

East of the Continental Divide, near or slightly above average flows are expected for the main Missouri and Yellowstone rivers. Near average flow is forecast for the Bighorn tributaries in Wyoming. For the North Platte, storage is less than average but slightly improved over a year ago. Streamflow during the snowmelt season is expected to be close to average and a year ago. A similar situation exists on the South Platte, but reservoir storage is more favorable due to lack of demand in 1967.

Lack of storage and nominal early season snowpack indicate the possibility of some water shortage on the Arkansas and Rio Grande in Colorado and New Mexico.

The California Department of Water Resources reports that the snowpack in the Cascades and northern Sierras is about normal for this date, but below normal in the central and southern Sierras. Carryover reservoir storage from the 1967 season is excellent. Thus, with normal precipitation during the remainder of the season, there will be adequate water supplies for all areas of the state.

The flow of the Columbia River and tributaries in Canada is expected to be near average and much less than the high flows which occurred in 1967. Tributary streams in the United States are forecast at less than average which brings the forecast at The Dalles, Oregon down to less than 90 percent of average for the snowmelt season.

MISSOURI BASIN

On February 1 about one-half of the snow accumulation season has occurred. Snowfall patterns during the late winter and spring months can change water supply outlook materially, especially on the Colorado River Basin and east of the Continental Divide.

Snowfall has been excessive on the Missouri River tributaries above Three Forks. February 1 snowpack approaches the April 1 average. In total, the snowpack on the Continental Divide in Montana equals the heavy, early season pack of 1967. This is the result of local storms. The snowpack pattern declines rapidly into central Montana to the east and south along the Continental Divide in Wyoming.

SUMMARY OF SNOW WATER EQUIVALENT MEASUREMENTS FEBRUARY 1, 1968

MAJOR BASIN AND SUB—WATERSHED	WATER EQUIVALENT IN PERCENT OF: LAST YEAR	AVERAGE
MISSOURI BASIN		
Jefferson	88	134
Madison	77	114
Gallatin	129	162
Missouri Main Stem	130	149
Yellowstone	82	105
Shoshone	72	71
Wind	92	100
North Platte	94	91
South Platte	118	90
ARKANSAS BASIN		
Arkansas	101	91
Canadian	185	69
RIO GRANDE BASIN		
Rio Grande (Colo.)	69	70
Rio Grande abv. Otowi Bridge	75	75
Pecos	202	108
COLORADO BASIN		
Green (Wyo.)	78	81
Yampa - White	93	100
Duchesne	62	82
Price	84	65
Upper Colorado	93	98
Gunnison	80	88
San Juan	100	107
Dolores	100	115
Virgin	120	115
Gila	1100	400
Salt	900	270
GREAT BASIN		
Bear	77	78
Logan	71	65
Ogden	101	87
Weber	80	84
Provo - Utah Lake	68	86
Jordan	80	80
Sevier	142	125
Walker - Carson	32	58
Tahoe - Truckee	64	91
Humboldt	39	48
Lake Co. (Oregon)	72	94
Harney Basin (Oregon)	66	62
UPPER COLUMBIA BASIN		
Columbia (Canada)	58	90
Kootenai	67	89
Clark Fork	91	102
Bitterroot	80	88
Flathead	66	79
Spokane	84	80
Okanogan	114	107
Methow	128	106
Chelan	122	80
Wenatchee	72	62

MAJOR BASIN AND SUB—WATERSHED	WATER EQUIVALENT IN PERCENT OF: LAST YEAR	AVERAGE
SNAKE BASIN		
Snake above Jackson, Wyo.	78	92
Snake above Hiese, Idaho	82	93
Snake abv. American Falls Res.	84	96
Henry's Fork	65	100
Southern Idaho Tributaries	65	88
Big and Little Wood	64	86
Boise	54	65
Owyhee	31	30
Payette	73	84
Malheur	78	72
Weiser	75	82
Burnt	70	72
Powder	60	45
Salmon	70	85
Grande Ronde	70	45
Clearwater	74	80
LOWER COLUMBIA BASIN		
Yakima	88	75
Hood	52	58
John Day	62	58
Deschutes - Crooked	62	61
Crooked	33	31
Willamette	66	65
Lewis	90	95
Cowlitz	72	75
PACIFIC COASTAL BASIN		
Puget Sound	63	68
Olympic Peninsula	72	84
Umpqua - Rogue	75	74
Klamath	69	73
Trinity	50	100
CALIFORNIA CENTRAL VALLEY		
Upper Sacramento	55	100
Feather	50	120
Yuba	45	100
American	40	90
Mokelumne	35	85
Stanislaus	35	80
Tuolumne	35	80
Merced	35	75
San Joaquin	35	80
Kings	40	85
Kaweah	35	80
Tule	50	80
Kern	30	75

Data for California Watersheds supplied by Dept. of Water Resources, and for British Columbia Watersheds by Dept. of Lands, Forests and Water Resources.

Average is for 1948-62 period. California averages are for the period 1931-1960.
Based on Selected Snow Courses determined by Distribution within the Basin, Length of Record and Repetitive Monthly Measurement Schedules.

Soil moisture under the snowpack is relatively high. The flow of the Missouri and Yellowstone during the snowmelt season is expected to be slightly above average, but much less than a year ago. Less than average flows are expected for the Marias and Milk rivers in northern Montana.

The flow of the Bighorn and tributaries in Wyoming is expected to be near average for the snowmelt season. Carryover storage in major reservoirs is near average and comparable to a year ago. The water outlook is favorable for the major streams.

With a slight increase in available storage over last year and at least average streamflow in prospect for the North Platte, the water supply outlook is satisfactory.

For the South Platte, storage in both Colorado-Big Thompson and smaller irrigation reservoirs is above average and a year ago. Even if the pattern of below average snowfall continues, water supply prospects are generally satisfactory for this area. Municipal reservoirs store slightly less than last year at this time, but more than adequate stored water is available.

ARKANSAS BASIN

Unless there is an improvement in the rate of snow accumulation, surface water will be short this year. Snowmelt season flow is forecast at about three-quarters of average. Storage is down from a year ago, slightly less than average and varies substantially among reservoirs. John Martin contains only 30,000 acre-feet as compared to nearly 200,000 a year ago. Soil moisture conditions are reported as only fair.

Storage in Conchas Reservoir on the Canadian in New Mexico is comparable to a year ago and near average. The most probable snowmelt season flow is near average with only a limited effect on total water supply for this area.

RIO GRANDE BASIN

Near normal flow is expected for the Rio Grande and its tributaries in Colorado. Valley soil moisture is reported as good. Reservoir storage is slightly deficient for San Luis Valley streams. In general, the water supply outlook is average.

Another short water year is in prospect for the Rio Grande through New Mexico. With heavy snowfall on the Rio Chama, flows below Otowi Bridge could be near or slightly above average for the 1948-62 period. However, reservoir storage continues to be extremely deficient, and normal demands exceed the average streamflow. Surface water supplies along the Pecos are slightly more favorable, but the total of storage and prospective runoff will probably be less than average.

COLORADO BASIN

Total effective snowpack on the upper Colorado River Basin is near average for February 1. The greatest deficiencies are on the Green River and its tributaries in Wyoming and Utah. Snowfall in excess of average has occurred on the San Juan and Dolores watersheds in southwestern Colorado at the edge of December storms centered in Arizona. Storage in Lake Powell and major reservoirs in the upper basin has increased slightly over a year ago with an equivalent reduction in storage at Lake Mead. Snowmelt season flow into Lake Powell is forecast at near average for this date.

An excellent water supply is in prospect for Arizona in 1968 extending favorable surface water supply for another year. Forecasts of the Salt, Gila and Verde rivers are for 200 to 300 percent of normal flow from now through the spring months. Moderately high runoff occurred in December and January adding substantially to the already excellent storage situation. Soil moisture is near field capacity at both valley and lower mountain elevations. At high mountain elevations, soils are still dry because of cold weather and no snowmelt. Even with no snowfall in January, the snowpack in the mountains exceeds any year since 1949.

GREAT BASIN

For the Utah section of the Great Basin, the combination of streamflow prospects and holdover reservoir storage is expected to provide a fair to good water supply for most irrigated areas of the state. Snowfall has been deficient in the extreme northern part of the state from near Ogden to the Idaho Border. Snowmelt season flow here may range from 70 to 80 percent of average. Near average flows are expected

SELECTED STREAMFLOW FORECASTS APRIL-SEPTEMBER 1968 as of FEBRUARY 1, 1968

STREAM AND STATION	1000 ACRE-FEET		PERCENT OF AVERAGE
	FLOW	FORECAST	
UPPER MISSOURI	1967	1968	1968
Jefferson at Sappington, Montana			
Madison near Grayling, Montana 1/	586		
Gallatin near Gateway, Montana			
Missouri near Zortman, Montana 2/			
Sun at Gibson Dam, Montana 3/	747		
Marias near Shelby, Montana 4/			
Milk near Eastern Crossing, Montana			
Yellowstone at Livingston, Montana			
Shields at Clyde Park, Montana			
Clark Fork at Chance, Montana			
Shoshone, Inflow to Buffalo Bill Res., Wyo.		800	100
Wind at Dubois, Wyoming		91	91
Bull Lake near Lenore, Wyoming		162	92
Tensleep near Tensleep, Wyoming		72	100
Yellowstone at Miles City, Montana 5/			
Missouri near Williston, N. Dakota 6/			
PLATTE			
North Platte at Saratoga, Wyoming		690	118
Laramie near Jelm, Wyoming 7/		120	112
Clear at Golden, Colorado		135	102
St. Vrain at Lyons, Colorado		83	96
Cache LaPoudre near Fort Collins, Colorado 8/		220	90
ARKANSAS			
Arkansas at Salida, Colorado 9/		280	72
Purgatoire at Trinidad, Colorado		45	100
RIO GRANDE			
Rio Grande near Del Norte, Colorado 10/		480	97
Conejos near Mogote, Colorado 11/		190	96
Rio Chama near LaPuente, New Mexico		250	117
Rio Grande at Otowi Bridge, New Mexico 12/		575	94
Pecos at Pecos, New Mexico *		64	120
UPPER COLORADO			
Colorado near Granby, Colorado 13/		230	99
Colorado near Glenwood Springs, Colorado 14/		1540	100
Roaring Fork at Glenwood Springs, Colorado 15/		750	98
Gunnison at Grand Junction, Colorado		1050	80
Dolores at Dolores, Colorado		290	111
Colorado near Cisco, Utah	2241	3700	98
Green below Flaming Gorge Res., Utah 16/ **	1516	920	81
Yampa at Steamboat Springs, Colorado		290	100
White at Meeker, Colorado		315	95
Duchesne near Tabiona, Utah 17/		105	92
Rock Creek near Mountain Home, Utah		92	90
Price near Scofield, Utah 18/		34	93
Green at Green River, Utah 16/	3494	2900	86
San Juan, Inflow to Navajo Res., N. M.		580	97
Animas at Durango, Colorado		490	107
San Juan near Bluff, Utah 19/	762	1130	96
Colorado, Inflow to Lake Powell, Arizona 20/ **	6045	7500	98
LOWER COLORADO			
Gila near Solomon, Arizona (Jan.-May)	30	353	261
Salt at Intake, Arizona (Jan.-May)	72	640	201
Verde above Horseshoe Dam, Arizona (Jan.-May)	73	400	216

SELECTED STREAMFLOW FORECASTS APRIL-SEPTEMBER 1968 as of FEBRUARY 1, 1968

STREAM AND STATION	1000 ACRE-FEET		PERCENT OF AVERAGE
	FLOW	FORECAST	
GREAT BASIN	1967	1968	1968
Bear at Harer, Idaho		235	91
Logan near Logan, Utah 21/	151	100	75
Ogden, Inflow to Pine View Res., Utah 22/**	138	80	70
Weber near Oakley, Utah	167	115	93
Inflow to Utah Lake, Utah		270	96
Big Cottonwood near Salt Lake City, Utah	45	35	90
Beaver near Beaver, Utah	30	23	95
South Fork Humboldt near Elko, Nevada			
Humboldt at Palisades, Nevada		90	52
Truckee at Farad, California 25/			
East Carson near Gardnerville, Nevada			
West Walker near Coleville, California		119	85
UPPER COLUMBIA			
Columbia at Revelstoke, British Columbia			
Kootenai at Wardner, British Columbia			
Kootenai at Leonia, Idaho	10045	7900	85
Flathead near Columbia Falls, Montana 26/	6954		
Flathead near Polson, Montana 26/	7687		
Clark Fork above Missoula, Montana	2061		
Bitterroot near Darby, Montana	575		
Clark Fork at Whitehorse Rapids, Montana 26/		12380	86
Columbia at Birchbank, British Columbia 26/	51557		
Spokane at Post Falls, Idaho 27/			
Columbia at Grand Coulee, Washington 26/	73507	65000	93
Okanogan near Tonasket, Washington	1818		
Chelan at Chelan, Washington 28/	1366		
Wenatchee at Peshastin, Washington	1700		
SNAKE			
Snake above Palisades Res., Wyoming 29/		2600	103
Snake near Heise, Idaho 29/	4120	3500	90
Henry's Fork near Rexburg, Idaho 30/			
Big Lost near Mackay, Idaho 31/	291	155	101
Big Wood, Inflow to Magic Res., Idaho 32/	466	290	91
Bruneau near Hot Springs, Idaho			
Owyhee Res., Net Inflow, Oregon	353	186	48
Boise near Boise, Idaho 33/	1419	1150	70
Malheur near Drewsey, Oregon		50	61
Payette near Horseshoe Bend, Idaho 34/	1788	1500	75
Snake at Weiser, Idaho			
Salmon at Whitebird, Idaho	7400	6000	86
Clearwater at Spalding, Idaho	8106	7700	84
LOWER COLUMBIA			
Grande Ronde at LaGrande, Oregon		120	59
Yakima at Cle Elum, Washington 35/			
Deschutes at Benham Falls, Oregon 36/		436	69
Columbia at The Dalles, Oregon 26/	108237	94800	87
Hood near Hood River, Oregon 36/		304	80
Willamette at Salem, Oregon 36/		5020	90
Lewis at Ariel, Washington 37/			
Cowlitz at Castle Rock, Washington	2436		

SELECTED STREAMFLOW FORECASTS APRIL-SEPTEMBER as of FEBRUARY 1, 1968

STREAM AND STATION	1000 ACRE-FEET		PERCENT OF AVERAGE
	FLOW	FORECAST	
	1967	1968	1968
NORTH PACIFIC COASTAL			
Dungeness near Sequim, Washington			
Rogue at Raygold, Oregon		813	81
Klamath Lake, Net Inflow, Oregon		500	78
CALIFORNIA CENTRAL VALLEY 38/**			
Sacramento, Inflow to Shasta, California	2760	1720	98
Feather near Oroville, California	3042	2100	113
Yuba at Smartville, California	1734	1100	101
American, Inflow to Folsom Res., Calif.	2302	1200	96
Cosumnes at Michigan Bar, California	333	125	98
Mokelumne, Inflow to Pardee Res., Calif.	831	370	80
Stanislaus, Inflow to Melones Res., Calif.	1340	530	75
Tuolumne, Inflow to Don Pedro Res., Calif.	2175	880	75
Merced, Inflow to ExchequerRes., Calif.	1232	430	72
San Joaquin, Inflow to Millerton Lake, Calif.	2327	900	77
Kings, Inflow to Pine Flat Res., California	2277	930	81
Kaweah, Inflow to Terminus Res., California	609	200	77
Tule, Inflow to Success Res., California	164	45	80
Kern, Inflow to Isabella Res., California	924	320	76

Forecasts in California provided by Department of Water Resources.
Average is for 1948-62 period except California. California is computed for 1916-65.
Forecasts assume average Effective Climate Conditions from Date Through Snow Melt Season.
Blank spaces indicate numerical forecasts are not available as of February 1.
Explanatory Notes on Forecasts listed on Inside Back Cover.
** April - June Period ** April - July Period*

for the Bear River through Wyoming, Idaho and Utah. In southern Utah, present prospects for snowmelt season flow are excellent. This area gained from being on the edge of heavy December storms in Arizona.

For Nevada streams, water supply outlook varies from well below average on the upper Owyhee, near average on the east slope of the Sierras to well above average for small streams in southern Nevada. Streamflow forecasts are for one-third of average in the Owyhee, one-half of average for the Humboldt and near average for the Truckee, Carson and Walker rivers. Storage on these latter streams is near average, but there is substantial deficiency in carryover storage on the Owyhee and Humboldt. Streamflow will be much less than for the 1967 water year, but if snowfall for the remainder of the season is near average, no material water shortage is anticipated.

At the present time water supply outlook in the Harney Basin of Oregon is poor--but fair to good in the Lake County area.

COLUMBIA BASIN

Seasonal snowfall to date varies widely over the basin. Mid-season snowpack ranges from near average on the upper Columbia and Okanogan watersheds in British Columbia and the upper Clark Fork in western Montana down to less than half of average in central and southeastern Oregon and southwestern Idaho. Except for the Cascade Range of Washington, also less than average, snow accumulation is much less than for this date in 1967 when it was excessive. The snowmelt season flow of the Columbia at The Dalles, Oregon, is forecast at 87 percent of average at this time.

The British Columbia Water Resources Service reports that February 1 snow surveys show that seasonal snow accumulation is below average on Vancouver Island, close to average on the watersheds of the Okanogan, Similkameen and Kootenai and slightly above average on the upper Columbia and Frazer River drainages. At this early date, near average flows are anticipated for the upper Columbia and its tributaries in Canada during the 1968 snowmelt season.

Snowpack on and prospective streamflow from watersheds tributary to the Columbia in western Montana is slightly less than average as of February 1. Snowpack in mid-season tends to be above average on the Clark Fork and Bitterroot watersheds and less than average on the Flathead, Kootenai and lower Clark Fork.

Except for the Methow and Okanogan watersheds snow accumulation to date over Washington state is less than average--much less in the eastern mountains. For the major irrigated area of the Yakima water supplies will be adequate because of storage as well as prospective inflow. Unless the snowfall rate improves some water shortages could occur on Okanogan tributaries and in southeastern Washington.

Snowfall on Snake River watersheds in Idaho has been less than average. February 1 snowpack ranges from 46 percent of average on the Palouse watershed in northwestern Idaho to 126 percent on the Camas-Beaver Creek drainages. The flow of the upper Snake River and its tributaries is expected to be near average. Prospects decline in western Idaho where snowmelt season flows in the range of 70 to 85 percent of average are forecast. On practically all of the small Snake River tributaries in southern and southwestern Idaho, there is a strong indication of a low water supply for 1968. On the main stem of the Snake River and on the Boise and Payette carryover storage will provide an adequate supplement to streamflow--assuming snowfall for the remainder of the season is near average. Precipitation at valley elevations in the form of snow or rain has tended to be relatively higher than at mountain elevations. Mountain soils tend to be dry while there is considerable moisture at lower levels.

Seasonal snowfall has been deficient over most of Oregon. This indicates a possible deficiency in water supply for some irrigated areas on the John Day, Umatilla, Deschutes, Crooked and Hood rivers along with other smaller streams in these areas. Storage is expected to make up expected streamflow deficiencies on the Owyhee and Malheur in southeastern Oregon. Water supplies are expected to be adequate in southwestern Oregon on the Umpqua, Rogue and Klamath rivers.

CALIFORNIA

The California Department of Water Resources, coordinating agency for snow surveys in California reports that February 1 forecasts indicate the state's water supplies will be adequate to meet normal demands this spring and summer. Based on normal precipitation occurring during the remainder of the season, runoff forecasts for the April-July period for Central Valley tributaries average near 100 percent of normal for the Sacramento Valley and 77 percent of normal for the San Joaquin Valley. Individual basin forecasts range from a low of 72 percent for the Merced in the San Joaquin Valley to 113 percent for the Feather in the Sacramento Valley. Southern California streams are expected to experience near normal runoff this year after two consecutive years of near double normal runoff.

State-wide precipitation since October 1 has been 85 percent of average with only southern California and parts of the North Coastal and Sacramento Valley areas experiencing above normal amounts for this period. After a dry October, November storms brought the first significant precipitation of this season to all areas of the state. In the main, the storms were concentrated in the southern Sierras and the coastal basins of southern California. November also saw the end of a period of above normal temperatures that had dominated California's weather for eight consecutive weeks. This was replaced by a regime of below normal temperatures which persisted until the last week of December. Precipitation during December was below normal throughout the state except for the Colorado desert area. The three storms that occurred during January were generally limited to northern California. The last of these began on January 27 and extended through the end of the month--dropping the snow level to 1000 feet in the north and 4000 feet in the south. Snow fell for the first time in 19 years at San Rafael in the San Francisco Bay area and on the hills of the San Francisco Peninsula; East Bay and Marin County were covered with snow.

February 1 snow surveys indicate that the snowpack water content is about normal for the Cascade and northern Sierra watersheds. For the San Joaquin Valley and Lahontan watersheds the snowpack water content is about 80 percent of normal. On February 1, the snow level was down to 1000 feet in the Sacramento Valley and 3000 feet in the southern Sierras.

Reservoirs throughout the state are above normal storage levels for this date except in the North Coastal area which is at about 90 percent of normal. February 1 storage in 120 California reservoirs with a combined capacity of 27,100,000 acre-feet is 115 percent of normal. Water carried over in storage from

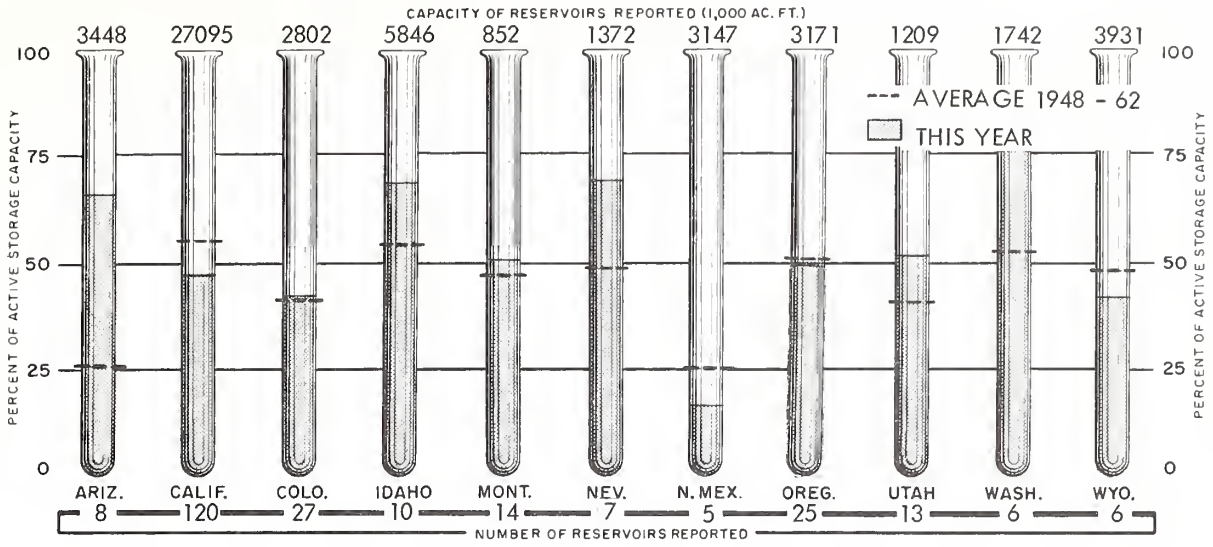
STORAGE IN LARGE RESERVOIRS FEBRUARY 1, 1968

BASIN AND NAME OF RESERVOIR	CAPACITY (1000 A.F.)	STORAGE (1000 A.F.)
UPPER MISSOURI		
Boysen	560	385
Buffalo Bill	380	142
Canyon Ferry	2043	1709
Hebgen	377	237
Tiber	1316	461
Yellowtail	1356	801
Belle Fourche	185	105
Keyhole	340	124
Fort Peck	19410	16100
Fort Randall	5800	2586
Garrison	24500	18512
Oahe	23600	19706
Big Bend	1900	1725
PLATTE		
Glendo	786	314
Pathfinder	1011	339
Seminoe	982	292
City of Denver	588	395
Colo-Big Thompson (4)	865	398
ARKANSAS		
Conchas	280	182
John Martin	367	33
RIO GRANDE		
Elephant Butte	2207	297
El Vado	194	1
UPPER COLORADO		
Flaming Gorge	3789	2165
Navajo	1709	592
Powell	28040	8137
Blue Mesa	941	384
LOWER COLORADO		
Havusu	619	547
Mead	27207	14566
Mohave	1810	1691
San Carlos	1206	381
Salt River Res. (4)	1755	1549
Verde River Res. (2)	323	136
GREAT BASIN		
Bear	1421	1062
Lahontan	287	226
Rye Patch	172	52
Sevier Bridge	236	65
Strawberry	265	124
Tahoe	732	559
Utah	1149	681

BASIN AND NAME OF RESERVOIR	CAPACITY (1000 A.F.)	STORAGE (1000 A.F.)
UPPER COLUMBIA		
Chelan	676	461
Coeur d'Alene	238	94
Flathead	1791	1272
Hungry Horse	2982	2034
Kootenay	673	657
Pend Oreille	1155	557
Roosevelt	5232	2482
LOWER COLUMBIA		
Cougar	155	1
Detroit	299	2
Hills Creek	200	1
Lookout Point	337	2
Yakima Res. (5)	1066	857
SNAKE		
American Falls	1700	1224
Arrowrock	287	217
Anderson Ranch	423	292
Brownlee	980	629
Cascade	653	302
Jackson	847	597
Lucky Peak	278	30
Palisades	1202	888
Owyhee	715	375
PACIFIC COASTAL		
Clair Engle	2448	1739
Clear Lake	440	182
Nacimiento	350	195
Ross	1203	1212
Upper Klamath	584	320
CALIFORNIA CENTRAL VALLEY		
Almanor	1036	733
Berryessa	1602	1532
Folsom	1010	596
Isabella	570	200
McClure	1026	615
Millerton	521	283
Oroville	3484	390
Pine Flat	1013	680
Shasta	4500	3246

Reservoir Storage Data Provided by Bureau of Reclamation, Corps of Engineers, Geological Survey, and water using organizations. Data from California and British Columbia provided by Department of Water Resources and Department of Lands, Forests and Water Resources, respectively.

RESERVOIR STORAGE as of FEBRUARY 1, 1968



last year's exceptional runoff is mainly responsible for this year's high storage.

Unimpaired runoff for the October-January period for California streams was about 70 percent of normal. Only in the Lahontan area was runoff above normal at 105 percent. Cold type storms and below normal precipitation combined to limit season to date runoff from tributaries of the Sacramento and San Joaquin valleys to 65 percent of their respective normals. During January runoff from the Sacramento and San Joaquin was 75 and 60 percent of normal, respectively.

U.S. DEPARTMENT of AGRICULTURE
CONSERVATION OF WATER BEGINS WITH THE SNOW SURVEY
SOIL CONSERVATION SERVICE

EXPLANATION of STREAMFLOW FORECASTS

All flows are observed flows except as adjusted for: 1/ Change in storage in Hebgen Lake. 2/ Change in storage in Canyon Ferry and Tiber reservoirs. 3/ Change in storage in Gibson Reservoir and measured diversions. 4/ Change in storage in Two Medicine, Four Horns and Lake Francis reservoirs. 5/ Change in storage in Boysen and Buffalo Bill reservoirs.

6/ Change in storage in Boysen, Buffalo Bill, Canyon Ferry, Tiber, and Fort Peck reservoirs. 7/ Plus diversions to Cache la Poudre. 8/ Minus diversions from North Platte, Laramie, and Colorado rivers plus measured diversions above station. 9/ Change in storage in Twin Lakes and Sugar Loaf reservoirs minus diversions from Colorado River.

10/ Change in storage in Rio Grande, Santa Maria, and Continental reservoirs. 11/ Change in storage in Platoro Reservoir. 12/ Change in storage in El Vado Reservoir. 13/ Change in storage in Granby Reservoir plus diversions to Cache la Poudre and through Adams Tunnel. 14/ Changes as indicated in (13) plus Moffatt Tunnel diversion. 15/ Plus diversions to Arkansas River.

16/ Change in storage in Flaming Gorge and Big Sandy reservoirs. 17/ Plus diversion through Duchesne Tunnel. 18/ Change in storage in Scofield Reservoir. 19/ Change in storage in Navajo Reservoir. 20/ (Lee's Ferry) Change in storage in Flaming Gorge, Navajo, Lake Powell, and Big Sandy reservoirs.

21/ Plus Utah Power and Light Company tailrace and Logan, Hyde Park, and Smithfield canals. 22/ (Inflow record computed by U. S. Bureau of Reclamation.) 23/ Plus diversion by Weber-Provo Canal and change in storage in Wanship Reservoir. 24/ Change in storage in Deer Creek Reservoir, minus diversions through Duchesne Tunnel and Weber-Provo Canal, plus diversion through Salt Lake City Aqueduct. 25/ Change of storage in Lake Tahoe and Boca Reservoir. (Forecast by Truckee Basin Committee)

26/ Change in storage in any of these reservoirs above the station: Kootenai Lake, Hungry Horse, Flathead Lake, Pend Oreille Lake, F. D. Roosevelt Lake, Lake Chelan, Coeur d'Alene Lake, Brownlee and Noxon; and pumpage at Roosevelt Lake. 27/ Changes in storage in Coeur d'Alene Lake and diversions by Spokane Valley Farms Company and Rathdrum Prairie canals. 28/ Change in storage in Lake Chelan. 29/ Changes in storage for Jackson Lake and Palisades Reservoir above stations. 30/ Change in storage in Henry's Lake, Island Park and Grassy Lake reservoirs and diversions between Ashton and Rexburg.

31/ Change in storage in Mackay Reservoir, and diversion in Sharp Ditch. 32/ (Combined flow Big Wood River nr. Bellevue and Camas Creek nr. Blaine.) 33/ Change in storage in Arrowrock, Anderson Ranch, and Lucky Peak. 34/ Change in storage in Cascade and Deadwood reservoirs. 35/ Change in storage in Keechelus, Kachess, and Cle Elum reservoirs plus diversion by Kittitas Canal. 36/ (Corrected to natural flow). 37/ Change in storage in Merwin, Yale, and Swift reservoirs. 38/ (Corrected for upstream impairments).

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SOIL CONSERVATION SERVICE
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